NUTRITIONAL GROUPING IN WISCONSIN DAIRY FARMS

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Feed Efficiency Workshop 2015

Outline:

- The scene behind the survey
- How do we define Feed Efficiency?
- Why is Feed Efficiency Important?
- The Survey
  - Objective
  - Results
- Summary

The scene behind the survey

- 2010 USDA-National Institute of Food and Agriculture (NIFA) through Agriculture and Food Research Initiative was requesting proposals for funding research projects in the program area:
  Improving Sustainability by Improving Feed Efficiency of Animals.
- The multi-state project: **Genomic Selection and Herd Management Tools to Improve Feed Efficiency of the Dairy Industry** was granted in 2011.

The scene behind the survey

- Universities in this project:
  - University of Wisconsin-Madison,
  - Michigan State University,
  - Iowa State University,
  - North Carolina A&T,
  - University of Florida,
  - Virginia Tech,
  - Wageningen UR, The Netherlands.

Overall Goals of the Project:

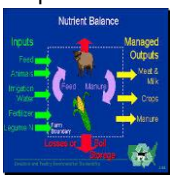
- Develop a dairy **Feed Efficiency** database seeded with genotype and phenotype data for 8000 Holstein cows
- Determine the genetic architecture of **Feed Efficiency** and build a foundation for genomic selection of more efficient animals.
- Develop and implement genomic breeding tools to produce cows with enhanced **Feed Efficiency**.

Overall Goals of the Project:

- **Develop and implement practical decision support tools to improve whole herd Feed Efficiency.**
- Educate future leaders, voters, and consumers about key practices in dairy husbandry that promote **Feed Efficiency** and Environmental Sustainability.

How do we define Feed Efficiency?

- Feed Efficiency can be considered in many ways:
  - One way is to consider all inputs and outputs of energy and nutrients on a global scale such as:
    - Efficiency of using human-edible inputs
    - Efficiency of using land
    - Inputs and outputs of fuels and greenhouse gases.



(VandeHaar et al, 2012)

How do we define Feed Efficiency?

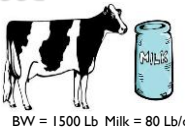
- Feed Efficiency can be considered in many ways:
  - The simplest would be pounds of milk per pounds of feed.

Efficiency of Producing MILK

(VandeHaar et al, 2012)

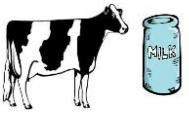
How do we define Feed Efficiency?

- Feed Efficiency (FE) is a measure to determine the relative ability of cows to turn feed nutrients into milk or milk components.
- It is expressed as:
  - Lb of Milk / Lb of dry matter consumed



BW = 1500 Lb Milk = 80 Lb/d

DMI = 50 Lb/d FE = 1.6



BW = 1500 Lb Milk = 80 Lb/d

DMI = 60 Lb/d FE = 1.33

(Maulfair et al., 2011)

Why is Feed Efficiency Important?

- FE is one tool for monitoring herd performance
- FE is correlated with environmental issues: if cows are more efficiently converting feed into milk, then less manure nutrients should be produced

(VandeHaar et al., 2012; Armentano and Weigel, 2013)

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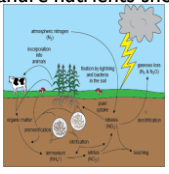
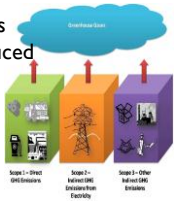
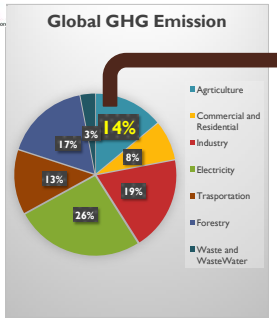
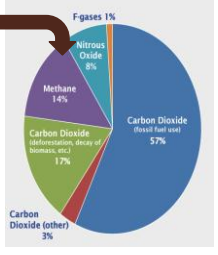


"N and P"



(VandeHaar et al., 2012; Armentano and Weigel, 2013)





(source: US Environmental Protection Agency. 2004)

Cow Feed Efficiency on Methane Emission

Item	High Efficient	Low Efficient
Milk yield (Lb/d)	110.7	92.8
DMI (Lb/d)	58.3	61.4
Milk / DMI	1.90	1.51
Methane (g/d)	802	1000

Four cows (DIM=100, two cows per group)
Same diet: 57:43 (F:C, forage: 27% CS and 30%AS), CP=17.3%.

(Arndt et al. 2011)

The Survey:

Objective:
To better understand the reasons for current grouping strategies, the limitations (perceived or real) to grouping for better nutritional management and precision feeding, and to quantify the proportion that use a single ration for all lactating cows in commercial dairy farms in Wisconsin and Michigan.

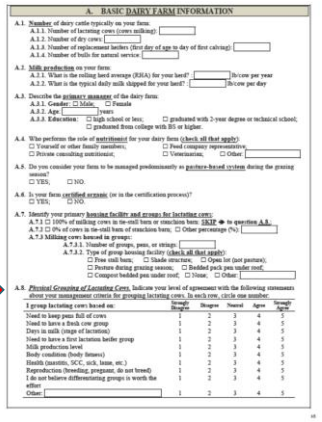
Methodology

Target: 2,000 dairy farms in states of the project
WI 971 farms ≥ 200 lactating cows (returned = 196, 20.2%)

MI 800 farms all herd sizes (211, 59 ≥ 200 and 152 ≤ 200 lactating cows, 26.4%)

WI dairy farms: 14,158 (2007 Census of Agriculture):
1-49 cows = 5836
50-199 cows = 7252
200 - ≥ 500 cows = 1070 (7.6%)

The Survey:



A. BASIC DAIRY FARM INFORMATION

A.1. Number of dairy cattle typically on your farm:
A.1.1. Number of lactating cows (cows milking):
A.1.2. Number of dry cows:
A.1.3. Number of replacement heifers (first day of age to day of first calving):
A.1.4. Number of bulls for natural service:

A.2. Milk production on your farm:
A.2.1. What is the rolling herd average (RHA) for your herd? lb/cow per year
A.2.2. What is the typical daily milk shipped for your herd? lb/cow per day

A.3. Describe the primary manager of the dairy farm:
A.3.1. Gender: ☐ Male; ☐ Female
A.3.2. Age: years
A.3.3. Education: ☐ high school or less; ☐ graduated with 2-year degree or technical school; ☐ graduated from college with BS or higher.

A.4. Who performs the role of nutritionist for your dairy farm (check all that apply):
☐ Yourself or other family members; ☐ Feed company representative;
☐ Private consulting nutritionist; ☐ Veterinarian; ☐ Other:

A.5. Do you consider your farm to be managed predominantly as pasture-based system during the grazing season?
☐ YES; ☐ NO.

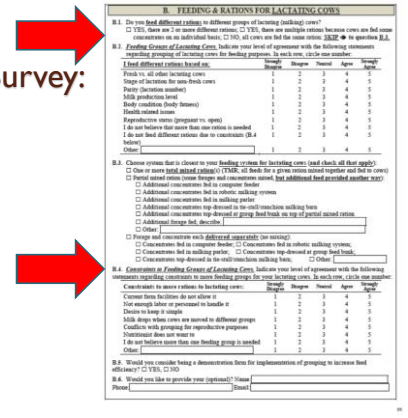
A.6. Is your farm certified organic (or in the certification process)?
☐ YES; ☐ NO.

A.7. Identify your primary housing facility and groups for lactating cows:
A.7.1 ☐ 100% of milking cows in tie-stall barn or stanchion barn; SKIP ➔ to question A.8.
A.7.2 ☐ 0% of cows in tie-stall barn of stanchion barn; ☐ Other percentage (%):
A.7.3 Milking cows housed in groups:
A.7.3.1. Number of groups, pens, or strings:
A.7.3.2. Type of group housing facility (check all that apply):
☐ Free stall barn; ☐ Shade structure; ☐ Open lot (not pasture);
☐ Pasture during grazing season; ☐ Bedded pack pen under roof;
☐ Compost bedded pen under roof; ☐ None ☐ Other:

A.8. *Physical Grouping of Lactating Cows.* Indicate your level of agreement with the following statements about your management criteria for grouping lactating cows. In each row, circle one number:

I group lactating cows based on:	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Need to keep pens full of cows	1	2	3	4	5
Need to have a fresh cow group	1	2	3	4	5
Days in milk (stage of lactation)	1	2	3	4	5
Need to have a first lactation heifer group	1	2	3	4	5
Milk production level	1	2	3	4	5
Body condition (body fatness)	1	2	3	4	5
Health (mastitis, SCC, sick, lame, etc.)	1	2	3	4	5
Reproduction (breeding, pregnant, do not breed)	1	2	3	4	5
I do not believe differentiating groups is worth the effort	1	2	3	4	5
Other:	1	2	3	4	5

The Survey:



B. FEEDING & RATIONS FOR LACTATING COWS

B.1. Do you feed different rations to different groups of lactating (milking) cows?
☐ YES, there are 2 or more different rations; ☐ YES, there are multiple rations because cows are fed some concentrates on an individual basis; ☐ NO, all cows are fed the same ration; SKIP ➔ to question B.3.

B.2. *Feeding Groups of Lactating Cows.* Indicate your level of agreement with the following statements regarding grouping of lactating cows for feeding purposes. In each row, circle one number:

I feed different rations based on:	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Fresh vs. all other lactating cows	1	2	3	4	5
Stage of lactation for sub-fresh cows	1	2	3	4	5
Parity (lactation number)	1	2	3	4	5
Milk production level	1	2	3	4	5
Body condition (body fatness)	1	2	3	4	5
Health related issues	1	2	3	4	5
Reproductive status (pregnant vs. open)	1	2	3	4	5
I do not believe that more than one ration is needed	1	2	3	4	5
I do not feed different rations due to constraints (B.4 below):	1	2	3	4	5
Other:	1	2	3	4	5

B.3. Choose system that is closest to your feeding system for lactating cows (and check all that apply):
☐ One or more total mixed rations(s) (TMR, all feeds for a given ration mixed together and fed to cows)
☐ Partial mixed ration (some forages and concentrates mixed, but additional feed provided another way)
☐ Additional concentrates fed in computer feeder
☐ Additional concentrates fed in robotic milking system
☐ Additional concentrates fed in milking parlor
☐ Additional concentrates top-dressed in tie-stall/stanchion milking barn
☐ Additional concentrates top-dressed or group feed bunk on top of partial mixed ration
☐ Additional forage fed, describe:
☐ Other:
☐ Forage and concentrate each delivered separately (no mixing)
☐ Concentrates fed in computer feeder; ☐ Concentrates fed in robotic milking system;
☐ Concentrates fed in milking parlor; ☐ Concentrates top-dressed at group feed bunk;
☐ Concentrates top-dressed in tie-stall/stanchion milking barn; ☐ Other:

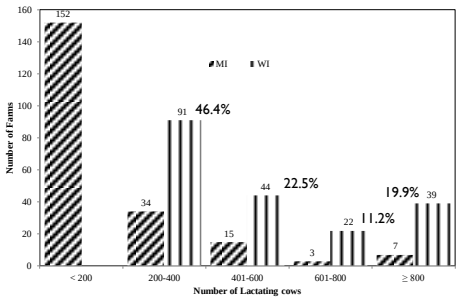
B.4. *Constraints to Feeding Groups of Lactating Cows.* Indicate your level of agreement with the following statements regarding constraints to more feeding groups for your lactating cows. In each row, circle one number:

Constraints to more rations to lactating cows:	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Current farm facilities do not allow it	1	2	3	4	5
Not enough labor or personnel to handle it	1	2	3	4	5
Desire to keep it simple	1	2	3	4	5
Milk drops when cows are moved to different groups	1	2	3	4	5
Conflicts with grouping for reproductive purposes	1	2	3	4	5
Nutritionist does not want to	1	2	3	4	5
I do not believe more than one feeding group is needed	1	2	3	4	5
Other:	1	2	3	4	5

B.5. Would you consider being a demonstration farm for implementation of grouping to increase feed efficiency? ☐ YES, ☐ NO

B.6. Would you like to provide your (optional)? Name:
Phone: Email:

Survey Returns Distribution



Description of the Herds

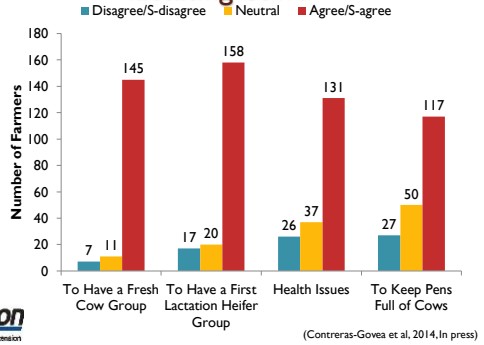
Items	Wisconsin (n = 196)
Herd size average (number of cows)	603 (SD ± 493)
Rolling herd average (RHA, Lb/cow per yr)	
All herd sizes	26,745 (SD ± 3100)
Minimum	15,468
Maximum	32,932
Milk yield (Lb/cow per d)	
All herd sizes	82.5 (SD±10.3)
Minimum	29.9
Maximum	104.7

Description of the Herds

Items	Wisconsin (n = 196)
Nutrition management (% of total respondents)	
Feed company	37.8
Consultant	32.1
Owner or farmer	3.6
Other[1]	25.5

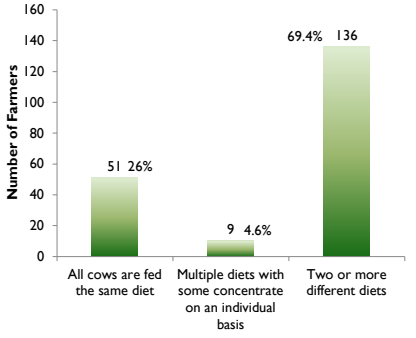
[1]Combination of two or more services such as: feed company, consultant, owner or farmer, and veterinarian.

Reasons for physical grouping lactating cows

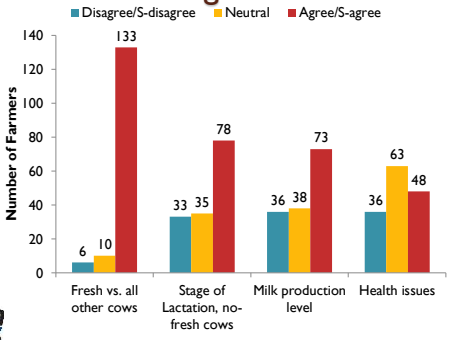


(Contreras-Govea et al, 2014, In press)

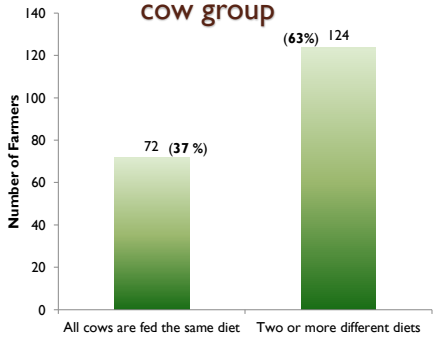
Feeding different diets



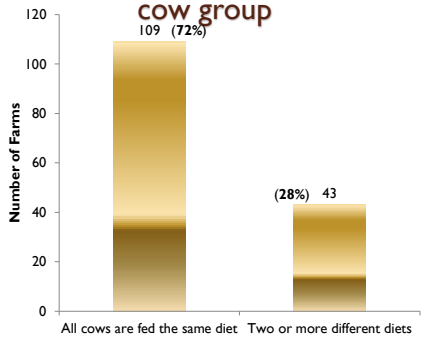
Reasons for feeding groups of lactating cows



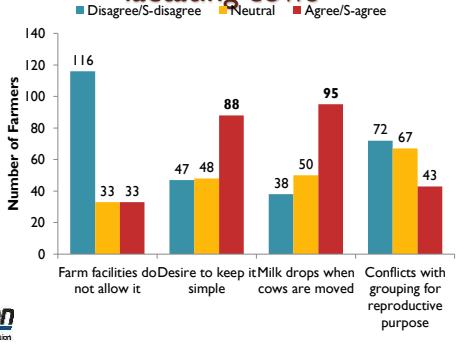
WI ≥ 200 Lactating cows Feeding different diets besides fresh cow group



MI ≤ 200 Lactating cows Feeding different diets besides fresh cow group



Constraints to feeding groups of lactating cows



How do we improve Feed Efficiency? But still:

- ❑Reduce the effect of "Milk drops when cows are grouped"
- ❑"Keep it Simple"

Feed Efficiency at herd level can be improved by:

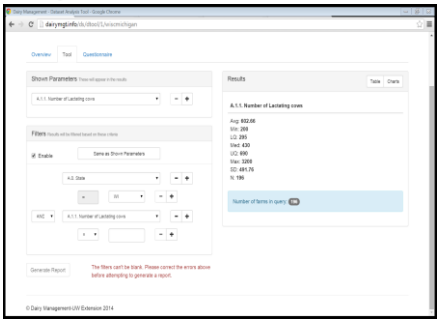
- ✓Better grouping
- ✓Feeding strategies
- ✓Reproduction and culling management
- ✓Diet formulation to match cow requirements
- ✓Genomics

(Allen, 2009; VandeHaar et al., 2012)

Survey tool:

The tool:
http://dairymgt.info/ds/dtool/1/wiscmichigan

Survey tool:



In Summary:

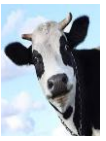
- ❑ Improving cow's feed efficiency is important to increase sustainability and reduce N and P excretion
- ❑ 37% of WI dairy farms with ≥ 200 lactating cows still feed one TMR diet to all lactating cows.
- ❑ Main constraints to practice more grouping or feeding more different diets to lactating cows were: "milk drops when moving cows" and "keep it simple"
- ❑ What are your main constraints for increasing Feed Efficiency?

Acknowledgment:

- USDA-National Institute of Food and Agriculture for funding this project: Grant no. 2011-68004-30340
- Wisconsin Dairy Business Association.
- Wisconsin and Michigan dairy farmers that kindly provided the information required for this study.

United States Department of Agriculture
National Institute of Food and Agriculture

DAIRY BUSINESS ASSOCIATION



Thank you for your attention

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